

## CLAIMS:

1. A video encoder for encoding a video signal to generate video data; the video encoder comprising:
  - means for generating (307), for at least a first picture element in a reference frame, a plurality of offset picture elements having different sub-pixel offsets;
  - 5 - means for searching (309), for each of the plurality of offset picture elements, a first frame to find a matching picture element;
  - means for selecting (311) a first offset picture element of the plurality of offset picture elements;
  - means for generating displacement data (313) for the first picture element, the displacement data comprising sub-pixel displacement data indicative of the first offset picture element and integer pixel displacement data indicating an integer pixel offset between the first picture element and the matching picture element;
  - 10 - means for encoding (315) the matching picture element relative to the selected offset picture element; and
  - 15 - means for including (317) the displacement data in the video data.
2. A video encoder as claimed in claim 1 wherein the means for selecting (311) comprises means for determining a difference parameter between each of the plurality of offset picture elements and the matching picture element and means for selecting the first offset picture element as the offset picture element having the smallest difference parameter.
- 20 3. A video encoder as claimed in claim 1 further comprising means for generating the first picture element (305) by image segmentation of the reference frame.
- 25 4. A video encoder as claimed in claim 3 wherein the video encoder is configured not to include segmentat dimension data in the video data.
5. A video encoder as claimed in claim 1 wherein the video encoder is a block based video encoder and the first picture element is an encoding block.

6. A video encoder as claimed in claim 1 wherein the means for generating (307) the plurality of offset picture elements is operable to generate at least one offset picture element by pixel interpolation.

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7. A video encoder as claimed in claim 1 wherein the displacement data is motion estimation data.

8. A video encoder as claimed in claim 7 wherein the displacement data is shift motion estimation data.

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9. A video encoder as claimed in claim 1 wherein one offset picture element of the plurality of offset picture elements has an offset of substantially zero.

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10. A video decoder for decoding a video signal, the video decoder comprising:

- means for receiving (401) the video signal comprising at least a reference frame and a predicted frame and displacement data for a plurality of picture elements of the reference frame;
- means for determining (405) a first picture element of the plurality of picture elements of the reference frame;
- means for extracting displacement data (409) for the first picture element comprising first sub-pixel displacement data and first integer pixel displacement data;
- means for generating a sub-pixel offset picture element (407) by offsetting the first picture element in response to the first sub-pixel displacement data;
- means for determining a location (411) of a second picture element in the predicted frame in response to a location of the first picture element in the first image and the first integer pixel displacement data; and
- means for decoding (413) the second picture element in response to the sub-pixel offset picture element.

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11. A video decoder as claimed in claim 10 wherein the means for determining a first picture element (405) is operable to determine the first picture element by image segmentation of the first frame.

12. A video decoder as claimed in claim 11 wherein the video data comprise no segment dimension data.

13. A method of encoding a video signal to generate video data; the method comprising the steps of:
- generating, for at least a first picture element in a reference frame, a plurality of offset picture elements having different sub-pixel offsets;
  - searching, for each of the plurality of offset picture elements, a first frame to find a matching picture element;
  - 10 - selecting a first offset picture element of the plurality of offset picture elements;
  - generating displacement data for the first picture element, the displacement data comprising sub-pixel displacement data indicative of the first offset picture element and integer pixel displacement data indicating an integer pixel offset between the first picture  
15 element and the matching picture element;
  - encoding the matching picture element relative to the selected offset picture element; and
  - including the displacement data in the video data.
14. A method of decoding a video signal, the method comprising the steps of:
- receiving the video signal comprising at least a reference and a predicted frame and displacement data for a plurality of picture elements of the reference frame;
  - determining a first picture element of the plurality of picture elements of the reference frame;
  - 25 - extracting displacement data for the first picture element comprising first sub-pixel displacement data and first integer pixel displacement data;
  - generating a sub-pixel offset picture element by offsetting the first picture element in response to the first sub-pixel displacement data;
  - determining a location of a second picture element in the predicted frame in  
30 response to a location of the first picture element in the first image and the first integer pixel displacement data; and
  - decoding the second picture element in response to the sub-pixel offset picture element.

15. A computer program enabling the carrying out of a method according to claim 13 or 14.
16. A record carrier comprising a computer program as claimed in claim 15.